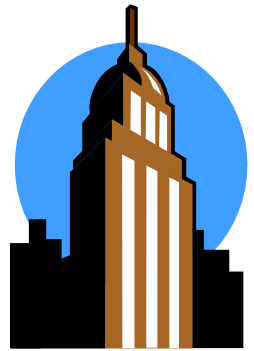
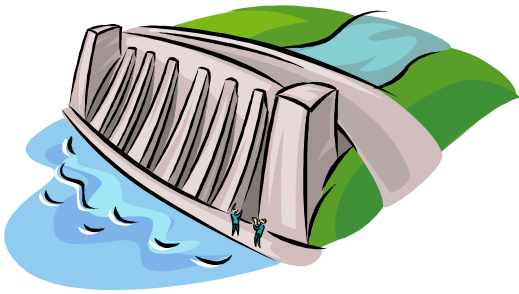


# Structural Engineering Note Packet



**This packet belongs to:**

**Name** \_\_\_\_\_ **Period** \_\_\_\_\_



**NAME:** \_\_\_\_\_ **Period:** \_\_\_\_\_

**Directions:** Complete this note packet while viewing the PowerPoint presentation.

1. List the 4 types of bridges, and **sketch** a picture of each:

1. \_\_\_\_\_ bridge      sketch picture→

2. \_\_\_\_\_ bridge      sketch picture→

3. \_\_\_\_\_ bridge      sketch picture→

4. \_\_\_\_\_ bridge      sketch picture→

2. Which type of bridge can span the farthest distance?

\_\_\_\_\_ bridge

3. What is your goal as a “Structural Engineer” in our competition?

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4. What is the definition of “efficiency”?

**Efficiency-** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. Write down the **efficiency formula** in the space below:

**Efficiency** = \_\_\_\_\_

First, watch the example in the PowerPoint...

**Next**, calculate the efficiency costs for the people below, and fill in the amounts on the chart. Remember, this is how much it costs each of them to support 1 pound! Who is the *real* winner? (You may use the calculator on your computer!)

| Engineer | Cost<br>(millions) | Critical Load<br>(pounds held) | Efficiency<br>(cost to support 1 pound) |
|----------|--------------------|--------------------------------|-----------------------------------------|
| Tim      | \$12,000,000       | 16                             | \$                                      |
| Jenny    | \$18,000,000       | 36                             | \$                                      |
| Joe      | \$24,000,000       | 40                             | \$                                      |
| Sarah    | \$36,000,000       | 50                             | \$                                      |

Now answer the questions below:

6. Which engineer *held the most* amount of weight? \_\_\_\_\_

7. Which engineer *held the least* amount of weight? \_\_\_\_\_

8. Which engineer *spent the most* amount of money? \_\_\_\_\_

9. Which engineer *spent the least* amount of money? \_\_\_\_\_

10. Which engineer is the *most efficient* (overall winner)? \_\_\_\_\_

11. Why is this person the *most efficient*? What makes them the overall winner? Explain your answer below:

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### Definitions:

12. **Critical Load-** \_\_\_\_\_

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13. **Optimization-** \_\_\_\_\_

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14. **Trade-offs-** \_\_\_\_\_

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### Forces Lab:

15. A *squeezing or pushing* force is called \_\_\_\_\_.

Sketch a picture below of this force in action:

*Your Picture* 

16. A *stretching or pulling* force is called \_\_\_\_\_.

Sketch a picture below of this force in action:

*Your Picture* 

17. A *twisting or turning* force is called \_\_\_\_\_.

Sketch a picture below of this force in action:

*Your Picture* 

18. A *sliding* force is called \_\_\_\_\_.

Sketch a picture below of this force in action:

*Your Picture* 

19. When a straight material flexes and becomes **curved**, the force is called \_\_\_\_\_.

Sketch a picture below of this force in action:

*Your Picture* 

### Loads Lab:

20. The weight of a structure itself is called the \_\_\_\_\_.

21. The weight of objects on the structure, like cars or people, is called the \_\_\_\_\_.

22. When the soil below a structure settles unevenly, it is called a \_\_\_\_\_.

23. When a structure expands or shrinks with changing temperatures, it is called a \_\_\_\_\_.

24. To allow movement, \_\_\_\_\_ are used in structures that get really hot or cold.

25. \_\_\_\_\_ walls are added for support to prevent an earthquake from shaking a structure.

26. \_\_\_\_\_ are used to stiffen a structure that experiences wind loads.

27. Bouncing and vibrating loads that change over time are called \_\_\_\_\_.

### Materials Lab:

28. Of the 8 materials listed, which are the 2 **most expensive**? \_\_\_\_\_ and \_\_\_\_\_.

29. Which material is the **lightest**? \_\_\_\_\_.

30. Which material is the **heaviest**? \_\_\_\_\_.

31. Circle the one that is **stronger** in compression and tension: concrete -OR- reinforced concrete

32. What are the ingredients in concrete? \_\_\_\_\_ and \_\_\_\_\_.

33. What is a con (or weakness) about steel? \_\_\_\_\_.

34. List all of the materials that would not rust or rot. These usually work well around water:

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## Shapes Lab:

35. Of the 3 shapes shown, which is the ***strongest***? \_\_\_\_\_.

36. What makes it the strongest shape (hint—think about balancing forces!)

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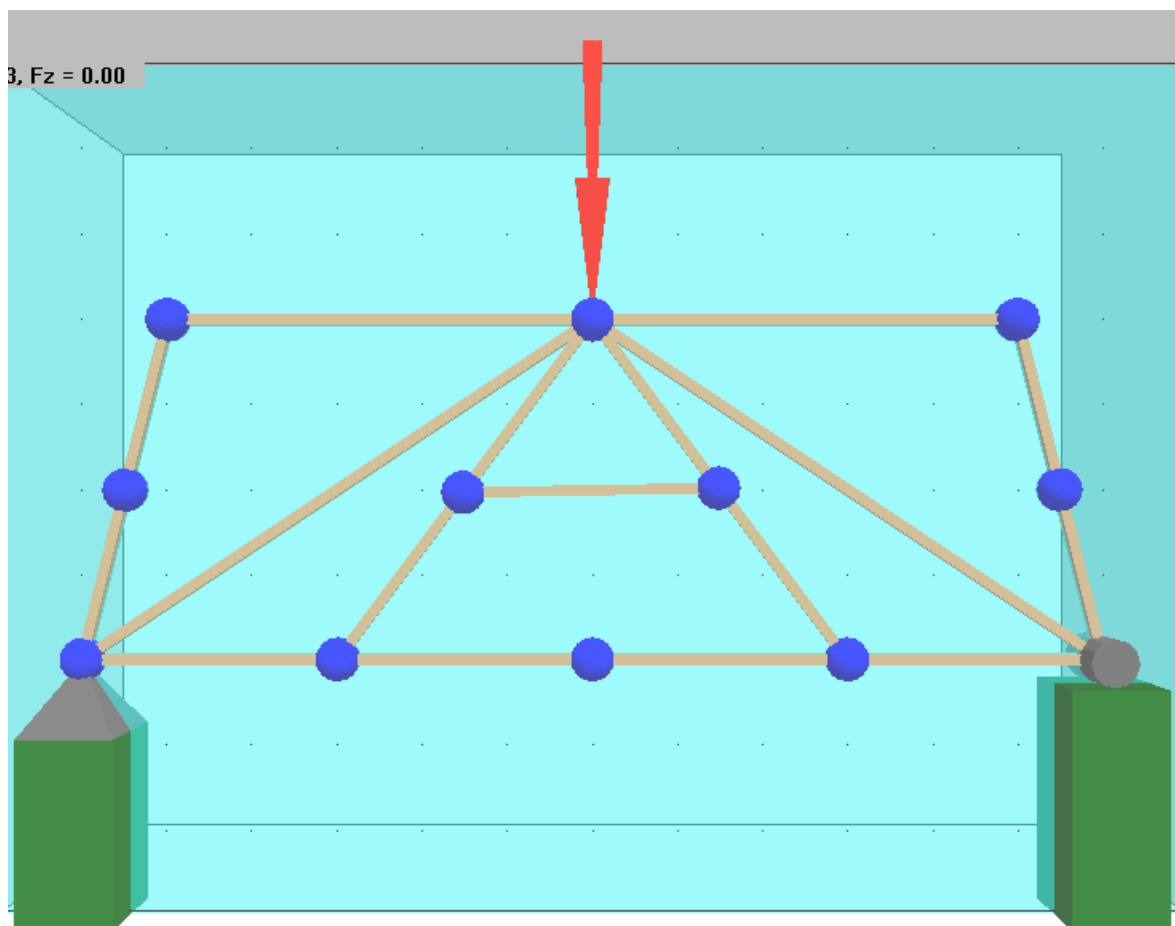
37. Of the 3 shapes shown, which is the ***weakest***? \_\_\_\_\_.

38. What could be done to make the weakest shape ***reinforced***, or stronger? **Sketch** your answer:

*Your Picture* ➡

## Parts of a truss:

**Label each part** on the picture below, and then complete the definitions on the next page...



## **Parts of a truss- Definitions:**

**39. Truss-** \_\_\_\_\_

\_\_\_\_\_

**40. Roadbed-** \_\_\_\_\_

\_\_\_\_\_

**41. Span-** \_\_\_\_\_

\_\_\_\_\_

**42. Members-** \_\_\_\_\_

\_\_\_\_\_

**43. Joints-** \_\_\_\_\_

\_\_\_\_\_

**44. Coordinates-** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**45. Gusset Plates-** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**46. Force Vector-** \_\_\_\_\_

\_\_\_\_\_